APPENDIX D
COST ESTIMATE DETAILS

Location	Description	Unit Cost	Unit	Quantity	Total	Rate
Bank Sediments	Expenses				--	
	Inoculum, including scaleup in lab, for pressure spraying surface and injecting subsurface, 20' onshore strip on 2 banks	$25	gal	300606	$7,515,152	2000 gal/ac
	Tank and spray applicator, tanker, truck, rental	$500	crew-day	301	$150,303	1000 gal/day/crew
	Injectors, rental	$10	crew-day	301	$3,006	
	Per diem for field crew of 3	$240	crew-day	301	$72,145	
	Labor				--	
	Work plans				$20,000	
	Field inoculation - layout/drive/drill holes, inject, spray	$1,200	crew-day	301	$360,727	$50 /hr for each of crew of 3
	Subtotal				$8,121,333	
	Management/planning, 10% of total				$812,133	
	Total, Bank Sediments				**$8,933,467**	
River Sediments	Expenses				--	
	Biocarb bags saturated with inoculum, 1 row, 20' intervals, 2 banks, staked or weighted				--	
	50# bags filled with activated charcoal	$50	bag	16368	$818,400	
	Inoculum, 5 gal per bag	$125	bag	16368	$2,046,000	
	Additional inoculum for injection	$25	gal	150303	$3,757,576	1000 gal/ac
	Boat, rental	$150	crew-day	188	$28,182	100 gal/hr
	Per diem for field crew of 3	$240	crew-day	188	$45,091	
	Labor				--	
	Field placement of bags and injection from boat	$1,200	crew-day	188	$225,455	$50 /hr for each of crew of 3
	Subtotal				$6,920,703	
	Management/planning, 10% of total				$692,070	
	Total, River Sediments				**$7,612,773**	
	TOTAL				**$16,546,240**	

Conversion of cost/river mile to cost/CY:			Range	
Banks only			-30%	+30%
Cost/mi = total cost / 31 mi	$288,176	$/mi	$201,723	$374,629
CY/river mi @ 6' deep, 20' wide, 2 banks	46933	CY/mi		
Cost/CY	$6.14	$/CY	$4.30	$7.98
River only				
Cost/mi = total cost / 31 mi	$245,573	$/mi		
CY/river mi @ 2' deep, 20' wide, 2 banks	15644	CY/mi		
Cost/CY	$15.70	$/CY		
Combined				
Cost/mi = banks cost/mi + riverseds cost/mi	$533,750	$/mi	$373,625	$693,875
CY/river mi = banks CY/mi + riverseds CY/mi	62578	CY/mi		
Cost/CY	$8.53	$/CY	$5.97	$11.09

Assumptions:

Bank Sediments

1. Assumed average width of treatment area on each bank is 20 feet, with actual width to be determined based on characterization studies by others.
2. Inoculum is assumed to be applied by pressure spraying onto surface and injecting into pre-driven/drilled holes.
3. Total average application rate is assumed at 2000 gal/acre, approximately one-third of the Test Site rate, based on previous experience. The higher rate was used at Test Site to accelerate remediation and demonstrate results within the limited contract period.
4. Assumed depth of treatment is average 6 feet on banks, utilizing subsurface injection and surface spraying.

River Sediments

1. Assumed average width of treatment area is 20 feet into river from each bank, with actual width to be determined based on characterization studies by others.
2. BioCarb bags saturated with inoculum are assumed to be placed at 20-foot intervals in the river.
3. Additional inoculum is assumed to be injected into sediments between bags.
4. Assumed depth of treatment is average 2 feet in river sediments.

General

1. Costs are valid only for the WSI/Lambda bioremediation technology.
2. Confirmatory or effectiveness sampling and other cost components common to other remediation technologies are not included.
3. Supplemental laboratory setup, which may be desirable to simplify logistics but is not essential, is not included.
4. Inoculation is assumed to occur during March or April, to minimize clearing needed.

5. Range of +/- 30% is applied (in general accordance with guidance from AACE,1992) to account for uncertainties related to the preliminary nature of engineering data available at this stage, such as physical access along the 31-mile length of riverbank (road access, slopes, density of vegetation, presence of ground cover such as leaf litter) that affects rate at which the crews can apply the inoculum, actual depth and lateral extent of contaminants to be treated (currently being characterized by others), and optimized application method (recommended for study, as described in Sections 10.2 and 11.1.E).